

Prediction for postnatal treatment of hydrocephalus in spina bifida fetuses that were repaired prenatally, based on prenatal brain imaging

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Objective

To determine if brain imaging in prenatally repaired spina bifida fetuses can predict the need for postnatal hydrocephalus treatment (HT).

Methods

Prospective cohort study. 47 spina bifida fetuses underwent an US and MRI at the moment of diagnosis (US1 and MRI1) (21. 8±2. 1weeks). Fetal spina bifida surgery (29 open/18 fetoscopic) was performed at 24. 5±1. 1 weeks. Six weeks later, MRI2 was performed(30. 3±1. 6weeks). Information from last US before delivery (US2) was also included(30. 4±6. 7weeks). In both US, ventricular width was assessed. The level of the lesion (LOL) was determined at MRI1. In both MRIs, the degree of hindbrain herniation (HBH) -adapted scoring system from Sutton et al. -, ventricular width and ventricular volume (VV) applying a super-resolution algorithm were assessed. VV growth=(MRI2VV-MRI1VV)/time between MRI2-MRI1. Ventricular growth was calculated accordingly using MRI and US mean ventricular width. The need for HT was determined by a pediatric neurosurgeon using clinical and radiographic criteria. All treated patients met MOMs trial criteria for hydrocephalus. The predictive value of each parameter was assessed by ROC curve analyses.

Results

Neonatal death occurred in 2 cases and 9 required HT. AUC of predictive accuracy for HT showed that MRI2 HBH grading had the strongest predictive value (0. 93;p<0. 01), outperforming others such MRI2 ventricular volume(0. 85;p0. 01), ventricular volume growth (0. 83;p0. 02), MRI ventricular growth (0. 85;p<0. 01). Other variables such as LOL, US2 mean ventricular width or US ventricular growth had an AUC<0. 7. Variables with highest AUC were assessed for an optimal cutoff to improve the prediction. The combination of MRI2 HBH grading ≥2 and MRI ventricular growth >0. 5mm/week led to a predictive positive value of 86%, and negative predictive value of 93% with AUC of 0. 98.

Conclusion

MRI assessment of HBH (6 weeks after prenatal spina bifida repair) may independently predict the need for postnatal treatment of hydrocephalus better than any US or MRI ventricular assessment alone.